FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

SYSTEMS SUBCOMMITTEE

FIFTH INTERIM REPORT

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Chairman, Systems Subcommittee

FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

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1.0. Introduction

1.1. Charter and Organization

In the Charter of the Advisory Committee on Advanced Television Service, the FCC assigned the Systems Subcommittee (SS) the objective to specify the transmission/reception facilities appropriate for providing advanced television (ATV) service in the United States. The scope of this function, as specified on page 2 of the Charter, includes the following activities:

"(a) Evaluate, on technical and economic bases, advanced television systems now under development for the purpose of determining feasibility for implementation in the United States;

"(b) Recommend advanced television system(s) now under development as candidate(s) for implementation, or specify the design of an appropriate system.

"(c) Advise on the appropriate transmission/reception technical standards and spectrum requirements for the recommended system(s)."

In brief, the Systems Subcommittee is to apply the guidance of the Planning Subcommittee (PS) to the technical analysis, testing, and economic analysis of various ATV system proposals, and develop a recommendation for the optimal ATV standard(s) for the United States. The recommendations of the Systems Subcommittee will be used both by the full Advisory Committee in its advice to the FCC, and by the Implementation Subcommittee (IS) in its identification of regulatory and policy issues and the development of a transition scenario to introduce a terrestrial broadcast ATV service.

The Subcommittee's organization includes Irwin Dorros (Bellcore) as Chair, and John Abel (National Association of Broadcasters) and Tyrone Brown (Steptoe and Johnson) as Vice Chairs. The Chair and Vice-Chairs of the Subcommittee, along with the Chairs and Vice-Chairs of its Working Parties, are collectively referred to as the Officers.

The substantive work of the Subcommittee has been divided into four Working Parties: (1) Systems Analysis; (2) System Evaluation and Testing; (3) Economic Assessment; and (4) System Standards. The Systems Subcommittee organization chart is included as Attachment A, which provides the names and affiliations of each of the officers. Attachment B is a listing of the Subcommittee meetings.

The functions of each Working Party (WP) are briefly described below, and summaries of their progress are provided in later sections of this Report. Detailed reports from each of the Working Parties are included as Attachments D through G.

Each Working Party has a Chair and three Vice Chairs, selected for their expertise as well as to provide balanced industry representation. Membership in the Working Parties is open to the public. All Subcommittee and full Working Party meetings are conducted in open fora.

SS/WP1 (Systems Analysis) is charged with collecting information from ATV proponents, analyzing the technical content of that information, and recommending which systems should proceed to the stage of testing by SS/WP2. Analysis of ATV systems is to be done in accordance with the guidance provided by the Planning Subcommittee, in particular, PS/WP1 (ATV Attributes).

SS/WP2 (System Evaluation and Testing) is charged with carrying out the appropriate objective and subjective testing of systems that have passed through the SS/WP1 screening program. Technical and procedural guidance are provided by several Working Parties in the Planning Subcommittee, particularly PS/WP2 (Testing and Evaluation Specifications) whose output is expected to incorporate the decisions of PS/WP1 (ATV Attributes), PS/WP4 (Alternative Media), and PS/WP6 (Subjective Assessment). The results of the SS/WP2 testing program will be key inputs to the SS/WP4 work on recommending the optimal ATV standard(s), and PS/WP3 as it considers spectrum utilization issues.

SS/WP3 (Economic Assessment) is charged with estimating the costs associated with each of the ATV systems. Guidance is to be provided by PS/WP5 (Economic Factors and Market Penetration) and IS/WP2 (Transition Scenarios). The economic analyses produced by SS/WP3 will be key contributions to the deliberations of SS/WP4 as it evaluates the various systems.

SS/WP4 (System Standards) is charged with recommending the ATV transmission standard(s) for the United States. As indicated above, key inputs will come from the other three SS Working Parties. In addition, SS/WP4 will consider the guidance and information provided by the Planning Subcommittee's Working Parties, as well as its Advisory Groups on Creative Issues and Consumer/Trade Issues. The recommendations of SS/WP4 will be used by the Advisory Committee in its advice to the FCC and by the Implementation Subcommittee in developing a plan for introducing a terrestrial ATV service in the United States.

1.2. Key Issues

1.2.1. Test Schedule

In the course of testing new, complex ATV transmission systems, the proponents, the laboratories, and the Advisory Committee are navigating uncharted waters. Much of this work has never been attempted before and new aspects of the systems need to be tested that were not previously foreseen. Despite heroic efforts on the part of all concerned, some extensions in the original testing schedule have occurred. The most significant ones are detailed in Section 3.2., below.

In particular, it is important to note that the last test report from the last laboratory, the report from ATEL on the ATVA Progressive system, is projected to be available to the Advisory Committee around the end of October 1992. It will then go to the proponent for review before being released to the Advisory Committee. Therefore, it is no longer realistic to expect that a final report will be completed by 30 September 1992. The Systems Subcommittee suggests that the Advisory Committee review the schedule for its work, taking into account the test extensions mentioned above, specifics of the recommendation process as discussed in the next section, and the schedule for field testing. The FCC should be urged to extend the time of the Advisory Committee's Charter.

1.2.2. Recommendation Process

As noted in Section 5.2., there has been a large turnover in attendance at meetings of SS/WP4. In formulating a recommendation for an ATV system that might serve as the basis for a new broadcasting standard in the United States, it is important that the participants represent a balance of expertise, have a sufficient knowledge of the work of the Advisory Committee and the systems under consideration, and not have a conflict of interest. This cannot be assured if it is unknown who the participants will be. The issue has been discussed with the Chair of the Advisory Committee, and other key individuals, who collectively agreed that the Advisory Committee should consider the appointment of a special panel, or Recommendation Task Force, with the responsibility of formulating recommendations for the Advisory Committee. The panel should have its membership drawn from the leadership of the Advisory Committee. It would not be appropriate for representatives of the system proponents to serve on the panel as voting members, but it is appropriate, and highly desirable in light of their particular expertise, for the proponents to serve on the panel as full participants in the discussions without a vote on the recommendation.

If such a body were empanelled, SS/WP4 would continue to produce all the information necessary to formulate a recommendation, but would not make a recommendation. That would be left to the special panel. At the request of the Chair of the Advisory Committee, Dr. Hopkins, Chair of SS/WP4, has prepared a document entitled, *SS/WP4 Actions Prior to the Meeting of the Special Panel* (Appendix 2), suggesting how the special panel might work, and what its relationship to SS/WP4 might be.

The Systems Subcommittee urges the Advisory Committee to create a Recommendation Task Force. It further recommends that the system proponents be part of the panel as full participants, but no vote on the recommendation, and that an opportunity be made available for public review of the panel's guidelines and methods of operation before they are adopted by the Advisory Committee.

2.0. Systems Analysis - Working Party 1

2.1. Charter and Organization

Systems Subcommittee Working Party 1 (SS/WP1) has the responsibility to analyze the various systems proposed for the distribution of ATV, determine the technical viability of each, and if appropriate, certify them for testing by Systems Subcommittee Working Party 2. SS/WP1 is guided in its work by the attributes developed by the Planning Subcommittee.

The Chair of SS/WP1 is Mr. Birney Dayton of NVision. He is assisted by three Vice-Chairs: Mr. Carl Eilers of Zenith, Dr. David Kettler of BellSouth Services, and Mr. John Swanson of Cox Broadcasting. The Secretary for the group is Mr. Bill Gaylord of BellSouth Services.

2.2. Summary of Progress to Date

SS/WP1 has met twice in plenary since the last report. On 6 November 1991, a meeting was held to consider final certification for the Zenith/AT&T Digital Spectrum Compatible System. Certification was granted at that meeting, and the system is scheduled to be delivered to the ATTC to begin testing within the next month.

More recently, the Advanced Digital Television System, developed by the Advanced Television Research Consortium (ATRC) was granted final certification for testing at a meeting held in Washington, DC on 30 January 1992. Of the six systems proposed, five have now been considered in depth and granted certification by SS/WP1 for testing by SS/WP2.

Throughout the last year, the Analysis Task Force, Chaired by Dr. Keeler, has worked hard, on a tight schedule, to examine the system descriptions and prepare documents necessary for the evaluation of each system by the full Working Party. The Task Force has also been active in the definition of system specific tests and digital specific tests, along with SS/WP2's Task Force on System Specific Testing.

2.2.1. Status of Proponents and Systems

The pace of system development and refinement has continued to accelerate in the year since the Fourth Interim Report. Shortly before the Report was issued, three proponents declared their intention to deliver all digital systems for testing, bringing the total number of digital proposals to four. While the composition of the

proponent organizations has changed somewhat, and the systems themselves have changed dramatically since last year, there are still six systems under evaluation. The following Table lists the current six systems, the proponents, and the certification status as of this writing.

System	Proponent	Certification Status
Advanced Compatible Television (ACTV)	Advanced Television Research Consortium (ATRC)	Final Certification Granted
Narrow MUSE	NHK	Final Certification Granted
DigiCipher	General Instruments	Final Certification Granted
Digital Spectrum Compatible Television (DSC-HDTV)	Zenith/AT&T	Final Certification Granted
Advanced Digital Television (ADTV)	Advanced Television Research Consortium (ATRC)	Final Certification Granted
ATVA Progressive System	American Television Alliance (ATVA)	Pre-Certification Granted

The Advanced Television Research Consortium (ATRC) is made up of the David Sarnoff Research Center, North American Philips, Thomson Consumer Electronics, NBC, and Compression Labs. The members of the American Television Alliance are General Instruments and MIT.

2.3. Future Work

As noted above, five of the six systems pre-certified for testing have been granted final certification. SS/WP1 will hold a meeting, most likely in April 1992, to consider final certification for the last system, the ATVA Progressive system. Assuming the system is granted final certification for testing at the meeting, as is expected, SS/WP1 will have completed the bulk of its work.

Unless assigned additional tasks by the Systems Subcommittee, SS/WP1's future efforts will be concentrated on writing its contribution to the SS/WP4 final report.

The Systems Subcommittee would like to thank SS/WP1, and especially the Chair, Mr. Dayton, and the Analysis Task Force Chaired by Dr. Keeler, for its extraordinary efforts on behalf of the Advisory Committee.

3.0. System Evaluation and Testing - Working Party 2

3.1. Charter and Organization

Systems Subcommittee Working Party 2 (SS/WP2) was established to conduct tests of proposed ATV systems based upon test procedures designed by the Planning Subcommittee and provide information from those tests to other entities in the Advisory Committee, such as SS/WP4, which will need it in the course of its work.

Mr. Mark Richer of PBS is the Chair of SS/WP2. He is assisted by three Vice-Chairs: Dr. Walt Ciciora of American Television and Communications, Dr. Joel Engel of Ameritech, and Mr. George Hanover of the Electronic Industries Association (EIA). The Chair and Vice-Chairs are collectively referred to as the Officers of the Working Party. The Secretary for the group is Mr. Alan Godber of ATTC. Mr. Ralph Justus of the EIA and Mr. Tom Harkinson of Capital Cities/ABC supported the Working Party as acting secretaries.

3.2. Summary of Progress to Date

SS/WP2 has held a total of 39 meetings to date, all in the Washington, DC area. Average attendance at a meeting is 32 persons.

The Working Party currently has two active Task Forces:

Task Force	*Chair*
Field Test Procedures	Jules Cohen
System Specific Testing	John Henderson

Until recently, Mr. John Watson of Group W had been the Chair of the Task Force on System Specific Testing, when he resigned due to the pressure of other obligations. The Systems Subcommittee would like to thank Mr. Watson, and acknowledge his many contributions to SS/WP2. Mr. John Henderson of Hitachi has agreed to replace Mr. Watson as the Task Force Chair, and the Systems Subcommittee is very grateful for that.

The Task Force on Test Prioritization, Chaired by Mr. Lynn Claudy of the National Association of Broadcasters, reviewed and optimized the test procedures with the goal of minimizing the time needed for testing each system. The Task Force on Audio Test Procedures, Chaired by Mr. Don Lockett of National Public Radio, developed both the objective and subjective audio test procedures plans. Both of these task forces, active at the time of the Fourth Interim Report, successfully completed their work and were disbanded. The Systems Subcommittee is grateful to the members of the task forces, especially the Chairs, Mr. Claudy and Mr. Lockett, for their contributions.

The Task Force on Field Test Procedures, Chaired by Mr. Jules Cohen, has developed and written the Field Test Procedures Plan, and the Task Force on System Specific Testing, Chaired by Mr. John Henderson of Hitachi, is developing specific test procedures for each system, and tests specific to the digital systems, to address the areas of concern developed by SS/WP1's Analysis Task Force.

Since the Fourth Interim Report, SS/WP2 has been primarily concerned with four activities: the development of system specific tests, the development of test procedures specific to digital systems, management and oversight of the laboratory tests, and planning for the Advisory Committee field tests.

3.2.1. Test Management and Test Procedures Plans

Most of the substantive work of SS/WP2 is contained in the Test Management Plan and the various Test Procedures Plans. The Test Management Plan (document SS/WP2-0124), that was first approved by the Advisory Committee at its 19 July 1989 meeting, has had little modification necessary since that time.

As expected, the complexity and innovative nature of both the proposed ATV systems and the procedures necessary to test them, have required some modifications and enhancements to the Test Procedures Plans. These modifications have all been properly documented.

In response to recommendations from the major national broadcasting organizations (document number SS/WP2-0817), SS/WP2 agreed to delete certain objective tests which were thought not likely to contribute useful information to the Advisory Committee in making its recommendation to the FCC. A total of five documents make up the basic Test Procedures Plans. They are:

Test Procedures Plan	*Document Number*
Objective and Transmission Tests	SS/WP2-0189
Cable Television Transmission Tests	SS/WP2-0357
Video Subjective Tests	SS/WP2-0390
Audio Subjective Tests	SS/WP2-0533
Field Test Procedures	SS/WP2-0601

3.2.1.1. System Specific Tests

The Test Management Plan allows for the possibility of system specific tests to be conducted based upon recommendations from SS/WP1's Analysis Task Force. In the event the task force identifies any "areas of concern" in the course of its work on a particular system, the SS/WP2's Task Force on System Specific Tests is charged with developing a procedure to stress that particular attribute.

Under the leadership of Mr. John Watson, the task force developed system specific tests for ACTV (document number SS/WP2-0707), Narrow MUSE (document number SS/WP2-0828), and DigiCipher (document number SS/WP2-0848). Members of the task force also participated in the conduct of these tests.

Originally, the test schedule allowed one day in each test slot for the possibility of conducting these system specific tests. The Working Party felt that these tests are critically important, and requested that a second day per system be made available for this purpose. The Advanced Television Test Center (ATTC) agreed to support the additional day per system, for which the Systems Subcommittee is grateful.

3.2.1.2. Digital Specific Tests

The entry of several digital systems into the Advisory Committee process presented some new challenges to SS/WP2. Modifications to the existing test procedures were made to ensure that the procedures adequately addressed the special characteristics of digital systems. In addition, new tests specific to the digital systems have been developed and adopted (document number SS/WP2-0847). The addition of these tests have required the Working Party and the ATTC to request additional financial support from the proponents providing digital systems for testing. These organizations have agreed to pay additional test fees to the ATTC for digital specific tests. CableLabs has agreed to conduct certain digital specific tests during their existing test time.

3.2.2. Test Facilities and Equipment

3.2.2.1. The Advanced Television Test Center (ATTC)

The Advanced Television Test Center (ATTC) was established in 1988 to conduct thorough and impartial tests on ATV systems and provide results to the FCC, its Advisory Committee, and the broadcast industry. ATTC, sponsored by CBS, Capital Cities/ABC, EIA, INTV, NAB, NBC, PBS, and MSTV, is conducting the laboratory based objective, broadcast-related, as well as joint broadcast-cable, tests. In addition, ATTC prepares digital video tape recordings for the non-expert viewer subjective tests of interference effects and basic received quality to be conducted at the Advanced Television Evaluation Laboratory (ATEL). ATTC also prepares digital audio tape recordings for subjective listening tests, which are being conducted by the Westinghouse Science and Technology Center under contract with the ATTC.

The ATTC and CableLabs provided SS/WP2 with their joint Test Administration Plan and Operations Manual (document number SS/WP2-0739).

The ATTC has successfully completed tests of three systems: ACTV, Narrow MUSE, and DigiCipher.

The first system, ACTV, moved into ATTC on 20 June 1991. The testing period ran from 12 July to 15 September 1991.

The nature of this enhanced NTSC system, and its NTSC-compatible elements, called for a week's longer test period than for other systems. In addition, during this test slot, some changes were made to the test materials used in certain tests; and, re-running the affected tests added two days. Also, a second system-specific test day was added at this point to each test slot.

During the course of this test slot, where the new multi-format taping techniques were first being used, some tape editing problems were encountered. Together with the large number of taped interference condition tests required for this system, this lead to difficulties in completing all editing ratings tapes as scheduled. Also, a misadjustment in ATTC hardware in part of the taping chain affected many of the tape recordings of the test results, which took time to analyze and correct. Corrective measures were worked out and implemented; but the delays in delivery of some ratings tapes to ATEL/Canada slowed the start and completion of their work. Nevertheless, at ATTC testing started on the second system as scheduled.

The draft report of testing on ACTV was circulated to the proponent in late January, and, together with the proponent's comments and the reports of the other laboratories, it will be released early in March.

The second system, Narrow-MUSE, moved into ATTC on 28 August 1991. Testing began on 20 September and concluded on 18 November 1991.

During the course of this test slot, a further change in test materials was adopted. This required extra time in order to redo the affected tests, and to add in a number of "benchmark" tests in order to relate the results using the changed test materials to those obtained with the test materials used on the first system. The "benchmark" tests must be conducted on all other systems too. In addition, the large amount of taping and editing continued, but the flow of ratings tapes to ATEL/Canada improved.

The draft report of testing on Narrow-MUSE will be circulated to the proponent as soon as it is completed, and, together with the proponent's comments and the reports of the other laboratories, it is expected to be released later in March.

The third system, DigiCipher, moved into ATTC on 26 November 1991. Testing began on 10 December 1991 and was completed on 20 February 1992.

During the course of this test slot, testing continued through the holiday period with a minimum break, so that the regular test plan was completed as planned, by 5 February. Two further tests which will affect the schedule, however, have been set for this and all the other "digital" systems. One set of further tests addresses expanded UHF taboo testing. The other is the set of eleven new tests added to address "digital specific" elements of each system. Both have required further

changes to the ATTC facilities, but the latter are of such technical complexity that they interrupted testing. The new digital-specific tests were undertaken when testing on this ATV system resumed in the period 12-19 February.

The draft report of testing on DigiCipher will be circulated to the proponent by early April, and, together with the proponent's comments and the reports of the other laboratories, it is expected to be released in May.

The fourth system, DSC-HDTV (Digital Spectrum Compatible HDTV) from Zenith/AT&T, will move into ATTC on 10 February 1992. After set up and interface, testing is expected to start by 2 March and run until about 24 April. The draft report on this system is planned for June.

The fifth system, AD-HDTV (Advanced Digital HDTV) from ATRC, is expected to move into ATTC in April and testing is planned to run approximately 4 May to 29 June. The report on this system is planned for August.

The sixth system, ATVA-Progressive from ATVA, is expected to move into ATTC in June and testing is planned to run approximately 8 July to 31 August. The draft report on this system is planned for September.

These estimates are based on current test plans and reflect test running times based on experience to date. They may, therefore, be affected by any future changes, including the conduct of the expanded UHF taboo testing which is expected to take differing lengths of time on each of the next three systems to be tested.

3.2.2.2. The Cable Television Laboratories (CableLabs)

Cable Television Laboratories, Inc. (CableLabs) was established in May, 1988 as a research and development consortium of cable television system operators representing more than 85% of the cable subscribers in the United States. It also has members representing 20% of Canada. CableLabs funds R&D projects that will help members take advantage of future opportunities and meet future challenges in the television industry. It also transfers relevant technologies to member companies and industry suppliers. In addition, CableLabs acts as a clearinghouse to provide information or current and prospective technological developments that are of interest to the cable television industry. CableLabs' ATV testing effort is centered in leased offices and laboratory space at ATTC in Alexandria, Virginia.

CableLabs has successfully completed tests on three systems: ACTV, Narrow MUSE, and DigiCipher.

The CableLabs portion of the tests on the first system, ACTV, began on 19 August 1991 and were completed on 23 August. Subsequent to the completion of the tests non-expert viewing tapes were made for evaluation at the Advanced Television Evaluation Laboratory (ATEL), in Ottawa. The non-expert video tapes have been

evaluated by ATEL. The draft CableLabs report was circulated to the proponent last month. The final reports from the three laboratories along with the proponent's comments, will be released late this month.

The CableLabs portion of the tests began on the second system, Narrow-MUSE, on 16 October 1991 and was completed on 22 October. The computer program used to automate the testing had been modified after the ACTV system to incorporate recommended changes in the procedure.

The tests were completed in the time allocated and non-expert tapes were produced for and shipped to ATEL for evaluation. The CableLabs report is presently being drafted and will be circulated to the proponent early next month. The final CableLabs report, along with other test laboratories reports and proponent comments, is scheduled to be released in late March.

The third system, DigiCipher, underwent CableLabs testing between 27-31 January 1992. The non-expert tapes are now being prepared for ATEL and are expected to be shipped by 17 February.

The draft report of the DigiCipher system is expected to be distributed to the proponent in early April and the final report, together with the other laboratories' reports and proponent responses, should be released in May.

The CableLabs schedule is dependent on the ATTC schedule as the tests are performed part-way through the proponent test period at the test center. The CableLabs tests for the remaining systems will be performed within the test schedule prepared by ATTC with the draft reports being circulated to the proponents about a month after the completion of the tests. The cooperation experienced between ATTC and CableLabs has helped ensure that testing and report generation at both laboratories has gone as smoothly as possible.

3.2.2.3. The Advanced Television Evaluation Laboratory (ATEL)

The Advanced Television Evaluation Laboratory (ATEL), located near Ottawa, is an off-premises laboratory of the Communications Research Centre, Department of Communications of Canada. The ATEL was developed to provide the special environment and facilities needed to conduct video subjective assessments of the ATV systems. The tests will be carried out under rigorously controlled conditions, ensuring valid and repeatable results.

The ATEL's activities are supported by a consortium of interests from government and industry in Canada. The members of this consortium are the Canadian Broadcasting Corporation (CBC), the Communications Research Centre (CRC) of Canada, the Department of Communications (DOC) of Canada, Leitch Video International (Canada), Rodgers Engineering (Canada), Tektronix (Canada), and Telesat Canada.

ATEL has provided SS/WP2 with its Test Management and Operations Plan (document SS/WP2-0784).

ATEL's tests of the ATRC ACTV system were begun 3 September 1991, three weeks later than expected, due to difficulties experienced at ATTC in preparing the necessary subjective testing tapes (see Section 3.2.2.1 above). Of the 14 subjective tests required, 12 were completed by 25 October 1991 and 2 were deferred, pending necessary re-work at ATTC. These tests were completed successfully in make-up sessions on 16-17 January 1992 and 5-10 February 1992. ATEL's report for the ATRC ACTV system will be ready by 21 February 1992.

Tests of the NHK Narrow-MUSE system were begun 4 November 1991, following a 5-day postponement resulting from the implementation of necessary test-bed modifications at ATTC. Of the 13 subjective tests required, all were completed by 3 February 1992. During the course of testing, two interruptions were encountered, one of 15 days resulting from necessary re-work at ATTC occasioned by changes in testing procedures and one of 2 days to accommodate make-up sessions for a deferred ACTV test. ATEL's report for the Narrow-MUSE system will be ready by 28 February 1992.

The conduct of tests at ATEL is contingent upon the timely completion of preparatory work at ATTC and CableLabs. Based on the information currently available and assuming 7 tests for the ATVA DigiCipher system and full testing for each of the other three systems that remain to be tested, ATEL's projected schedule is as given below. (ATEL, of course, will make all reasonable efforts to capitalize upon any opportunity to accelerate this schedule).

System	Start	Finish	Report To Proponents
ATVA-DigiCipher	Feb 1992	Mar 1992	Apr 1992
Zenith/AT&T DSC-HDTV	Mar 1992	May 1992	Jun 1992
ATRC ADTV	Jun 1992	Jul 1992	Aug 1992
ATVA-Progressive	Aug 1992	Sep 1992	Oct 1992

3.2.3. Field Tests

The Advisory Committee does not plan to field test all of the systems currently scheduled for laboratory testing. It's goal is to field test a single system. A contingency plan will be developed to handle the unlikely case that the system selected on the strength of its performance in the laboratory fails in the field.

The Task Force on Field Testing, Chaired by Mr. Cohen, has developed and approved the procedures manual for the field test program (document number SS/WP2-0601). While it is understood that these procedures will be refined as the testing approaches, it is a good basis to plan the tests. The FCC Field Operations

Bureau has made some suggestions regarding receive site selection which will be incorporated into the next revision of the test procedures.

Charlotte, North Carolina has been selected as the site for the Advisory Committee field tests. Charlotte provides both the necessary variety of terrain and the available spectrum capacity (document number SS/WP2-0770). The FCC has approved Charlotte as the field test site (document number SS/WP2-0831).

Several manufacturers have agreed to provide the antennas, transmission lines, transmitters, and most of the RF hardware for the tests. Most NTSC and ATV audio and video equipment is expected to come from the manufacturers. A source for a field measurement truck is still under investigation. Personnel to conduct the tests will include representatives from the system proponent and the FCC. The Systems Subcommittee is grateful to all these organizations for their generosity.

The remaining costs for the field test program have been estimated at $1 million dollars. The proponents have agreed to provide the necessary funds for the tests. The FCC Field Operations Bureau has also agreed to support the field tests, including perhaps the loan of a test vehicle.

The cable TV industry, through CableLabs, has committed to provide the resources necessary to conduct the cable portion of the field test program.

The Public Broadcasting Service (PBS) will manage and conduct the field tests, and be responsible for overall coordination of the program. Mr. Edmund Williams has been hired by PBS to act as Field Test Manager.

MSTV will provide technical support and assistance to PBS in the preliminary analysis of the test results from the broadcast portion of the tests.

CableLabs will assist PBS in conducting the cable portion of the field test program, and will be the primary organization responsible for analyzing the cable test results.

3.3. Future Work

While much has been accomplished by SS/WP2, much remains to be done. As testing continues, the Working Party will continue to play a critical role. The Working Party has a number of important tasks ahead of it in the coming months, including:

(1) *Dissemination of Test Data.* SS/WP2 has been designated by the Advisory Committee as the single point of contact for the test laboratories. In this role, the Working Party is responsible for the timely distribution of test results to other entities in the Committee, for example PS/WP3 and SS/WP4.

(2) *Continued Development of System Specific Tests.* As part of the certification process, SS/WP1's Analysis Task Force will develop "areas of concern", that is, possible weaknesses in the design of each system which may not be adequately exercised by the existing test procedures. Using that information, SS/WP2 will develop specific tests for each system to address those areas of concern.

(3) *Planning for the Field Tests.* SS/WP2 will continue to refine the field test procedures, plan the test program, and work with the proponents, equipment manufacturers and PBS, MSTV, CableLabs (as managers of the field test program), and the FCC to prepare for the conduct of the tests.

(4) *Management and Oversight of the Laboratory Tests.* Throughout the remainder of the testing process, SS/WP2 will be the body to oversee the conduct of the laboratory tests and address any areas of concerns on the part of the laboratories or the proponent organizations to help ensure the testing process runs smoothly.

To guide the work of SS/WP2 and the laboratories, the Test Procedures Plans and the Test Management Plan must be "living" documents. The Working Party anticipates that the plans, even after approval by the Advisory Committee, will have to be modified and updated occasionally throughout the testing process as new information becomes available, and it will have to have some flexibility in this regard. The Advisory Committee recognized this fact when it authorized Chairman Wiley, at the 19 July 1989 meeting, to make minor modifications and amendments to the plans without full Committee review and approval.

4.0. Economic Assessment - Working Party 3

4.1. Charter and Organization

The charter of Systems Subcommittee Working Party 3 (SS/WP3), calls for the establishment of costs associated with the distribution of advanced television and for an assessment of the economic and technological feasibility of each of the systems proposed for transmission of an ATV service.

The Chair of SS/WP3 is Mr. Larry Thorpe of Sony Advanced Systems. He is assisted by three Vice-Chairs: Ms. Shellie Rosser of Anixter Corporation, and Mr. Richard Grefe of the National Association of Public Television Stations. The Systems Subcommittee was saddened to learn recently that Mr. Loveless, a Vice-Chair of SS/WP3, had passed away after a short illness. He will be remembered by all who knew him as a fine man who made many contributions to the industry over a long career. The secretary for the group is Rupert Stow.

4.2. Summary of Progress to Date

The Working Party has held a total of twenty-six meetings to date, four since the Fourth Interim Report was issued.

Prior to the Fourth Interim Report, SS/WP3 had undertaken a comprehensive study of the total ATV distribution infrastructure. Following the spirit of the Advisory Committee's charter, the Working Party placed particular emphasis on the terrestrial broadcast network system. Other systems, such as the satellite feeder system and cable systems were examined from the viewpoint of their interface with the broadcast system.

By the beginning of 1991, SS/WP3 had gone as far as possible in developing system block diagrams describing both a local TV station conversion to an ATV simulcast system and a total network ATV infrastructure. Models in the form of spread sheets had been prepared to allow the costs of either conversion to be analyzed, provided realistic cost estimates existed for the components.

However, these costs could not be estimated without some details of the system designs, details only the proponents could supply. Because the systems were still in development, the designers themselves often had no firm idea of the projected cost of the final hardware. For this reason, until more information is available, SS/WP3 decided to spend the greater part of 1991 refining the growth curves describing market penetration of ATV service to U.S. homes.

Since the growth of an ATV service requires penetration of both ATV originating equipment and consumer receivers, the Working Party has been working (in cooperation with PS/WP-5 and IS/WP-2) to develop and refine models in both areas.

A letter was prepared by SS/WP3 and mailed to all ATV proponent organizations in December 1991, formally requesting the appointment of a key expert representative to a newly formed Cost Analysis Specialist Group. The group will begin a series of meetings early in 1992 to examine the encoding hardware of each system in detail. By having all the proponents represented on this important group, a measure of fairness via peer scrutiny will be ensured.

In September 1991, a new Receiver Costs Task Force was formed, Chaired by Ralph Justus of EIA. The task force has held a series of meetings by teleconference. In addition to assembling and reviewing past efforts to establish ATV receiver costs, it has drafted some ATV receiver strawman assumptions, and prepared a generic block diagram of an ATV receiver. The group is expected to be very active in the coming months.

4.3. Future Work

During the next work period, SS/WP3 will continue to refine its models for ATV penetration, considering both the phased introduction of ATV origination equipment, and the growth of demand for consumer ATV receivers. Based upon this analysis, the Working Party will supply important information to SS/WP4 as it considers the three Selection Criteria related to economics: Cost to Broadcasters, Cost to Alternative Media, and Cost to Consumers.

5.0. System Standards - Working Party 4

5.1. Charter and Organization

Systems Subcommittee Working Party 4 (SS/WP4), the Working Party on System Standards, has the responsibility to examine all the available data gathered or developed by other Working Parties and Advisory Groups in the Advisory Committee and, based upon that information, recommend a standard or standards for the terrestrial transmission of advanced television service. Recommendations developed by SS/WP4 will be used by the full Advisory Committee as it develops its own recommendations and advice for the FCC, and by the Implementation Subcommittee, whose charter includes the development of a transition scenario for the introduction of advanced television service in the United States.

The Chair of SS/WP4 is Dr. Robert Hopkins, Executive Director of the Advanced Television Systems Committee. He is assisted by three Vice-Chairs: Dr. Hugo Gaggioni of Sony Advanced Systems, Mr. Bruce Sidran of Bell Communications Research, and Mr. Louis Williamson of American Television and Communications. Mr. Gerald Robinson of Scientific Atlanta serves as Secretary for the group. The Chair and three Vice-Chairs are collectively referred to as the Officers.

There are currently two task forces active in SS/WP4. The Task Force on Report Drafting, Chaired jointly by Mr. Tawail of MSTV and Mr. Claudy of NAB, is charged with writing the final report of SS/WP4. Mr. Sidran served as Chair of this task force from its formation until the last meeting of SS/WP4, when he resigned because of the burden of other obligations. The Systems Subcommittee expresses its gratitude to Mr. Sidran for his many contributions.

A new task force was empanelled during this reporting period - the Task Force on Data Analysis. Mr. MacCarn of WGBH-TV serves as its Chair. The task force is responsible for analyzing the data resulting from the laboratory tests of the proposed ATV systems.

During the reporting period the Task Force on Data Format completed its work, and the members of SS/WP4 agreed that the task force could be disbanded. The Systems Subcommittee expresses its gratitude to the members of the Task Force, and especially to its Chair, Dr. Gaggioni.

5.2. Summary of Progress to Date

The Working Party has held a total of thirteen meetings, most recently on 5 November 1992. Average attendance at a meeting has been 26 persons. A total of 119 persons have attended at least one meeting, three quarters of whom (89) have attended three meetings or less. Eleven persons have attended more than half of the SS/WP4 meetings.

SS/WP4 has developed a process for recommending an ATV system. A copy of the flowchart for the Process may be found in Appendix 1 of this report. The Selection Criteria constitute the key issues that must be examined in order to recommend an ATV system. Each of the proposed systems will be measured against the Selection Criteria and compared against the others in those key areas to determine which system could offer a superior service. The Process has provisions for review or reconsideration as new information becomes available.

The Working Party has agreed to a list of ten Selection Criteria. The list is shown in Appendix 3. The ten criteria fall into three general categories: Spectrum Utilization (Coverage Area and Accommodation Percentage), Economics (Cost to Broadcasters, Cost to Alternative Media, and Cost to Consumers), and Technology (Audio/Video Quality, Transmission Robustness, Scope of Services and Features, Extensibility, and Interoperability Considerations). Target values of the Selection Criteria have been developed to represent the level of performance aspired to in an ATV service. The target values are shown in Appendix 4.

The outline for the SS/WP4 final report is shown in Appendix 5. The first six chapters will include background information and contributions from the other working parties.

The Recommendation Process prescribes the manner in which chapters seven through nine will be written. The first block, "Determine Selection Criteria for an ATV Service", will be the content of chapter seven. In this chapter, the Selection Criteria will be defined and their importance in the selection of an ATV system will be explained. The methods used to measure the actual performance of the proposed systems against the Selection Criteria will be described.

The second block of the Recommendation Process, "Analyze Systems and Select Those Which Satisfy the Selection Criteria", will be the content of chapter eight. Each system will be analyzed according to the Selection Criteria. The analyses related to the Spectrum Utilization and Technology criteria will be based upon the laboratory test data. The analyses related to the Economics criteria will be based upon the work of SS/WP3. Analyses of the Spectrum Utilization data will be done by PS/WP3.

The next three blocks, "Determine and Compare Significant Differences", "Identify Superior Systems(s)", and "Recommend Single System for ATV Service", will be the content of chapter nine. The proposed systems will be compared, one against the others, and recommendations will be detailed in chapter nine.

5.3. Future Work

The future work of SS/WP4 can best be viewed as writing the final report, and, of course, performing the analyses necessary to write the report. The writing of chapter seven, which details the Selection Criteria, is underway and portions will continue to be adopted by SS/WP4 as they become available. The work of writing the report is assigned to the Task Force on Report Drafting.

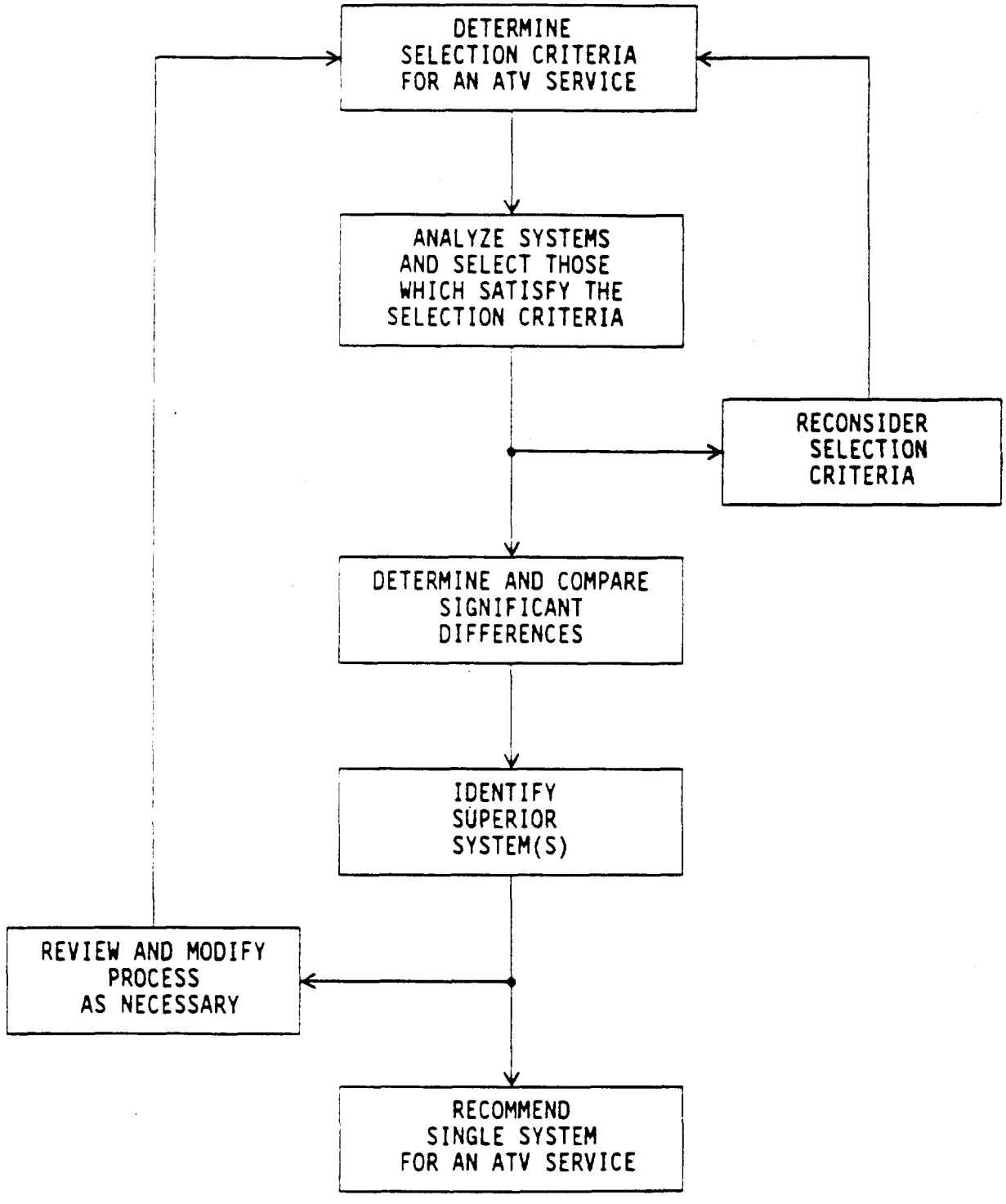
Chapter eight will be written after test results are available on the proposed systems. As the laboratory report on each tested system is issued, the Task Force on Data Analysis will begin its work on that system, and subsequently, SS/WP4 will meet as a whole to discuss and adopt that section of the report. The schedule for this work is completely dependent upon the receipt of test data, and it should be noted that none of the test results are yet available to SS/WP4.

6.0. Acknowledgements

The Systems Subcommittee would like to recognize the outstanding progress, and the significant contributions, made since the Fourth Interim Report by the individuals in the Working Parties. This work is done by dedicated professionals donating their time, despite hectic schedules, for the public good. We deeply appreciate their continuing participation and their sacrifices.

We would also like to recognize and thank the ATV system proponents. They are the real heroes in this endeavor, investing time, energy, and money to help develop an American ATV service second to none.

RECOMMENDATION PROCESS



SS/WP4 Actions Prior to the Meeting of the Special Panel

- SS/WP4 has developed a process for recommending an ATV system to the Advisory Committee (see Appendix I).

- SS/WP4 has developed a list of ten Selection Criteria (the first step in the Recommendation Process) and their associated target values (see Appendix II and Appendix III). The Selection Criteria fall into three categories:
  - Spectrum Utilization
  - Technology
  - Economics

- SS/WP4 has developed an outline for its final report (see Appendix IV). The first six chapters will include background information and contributions from other working parties. Chapters seven through nine will be the substantive contributions of SS/WP4. (Chapter seven will explain the Selection Criteria and their importance in the selection of an ATV system. Chapter eight will contain the analysis of each proposed system. Chapter nine will contain a comparison of proposed systems and recommendations.) The remainder of the final report will contain conclusions and other information regarding work which must be done in the future.

- SS/WP4 will write a report on each proposed system based on test data and economic analysis for inclusion in chapter eight of the SS/WP4 final report. The Selection Criteria will be the basis upon which each system is analyzed. (PS/WP3 will provide test analysis on Selection Criteria related to Spectrum Utilization. SS/WP4 task force will provide test analysis on Selection Criteria related to Technology. SS/WP3 will provide analysis on Economics related Selection Criteria.) These reports will be written, system by system, as test data becomes available. SS/WP4 will not attempt to reach conclusions in the individual system reports but will assure that a fair and balanced report is written on each system.

- After all system reports are completed and adopted by SS/WP4, one last meeting of SS/WP4 may be required to adopt a summary report. SS/WP4 would leave part, or all, of chapter nine (Comparisons and Recommendations) of the SS/WP4 final report to be completed by a Special Panel (or Recommendation Task Force) to be appointed by the Advisory Committee Chairman.

The Special Panel Meeting

- The Special Panel (or Recommendation Task Force) would meet shortly after the last SS/WP4 meeting. Its assigned objective would be to recommend an ATV system to the Advisory Committee.

- The meeting would begin on a Monday morning in a hotel in the Washington, D.C. area, but not downtown. The meeting would be conducted in a formal manner, similar to ITU meetings (CCIR and CCITT), with controlled interventions. The meeting would be open to the public, as are all Advisory Committee meetings, but for observation only.
    - Large table with assigned seating for the panelists
    - Chairs provided at the periphery of the room for observers
    - Strict, formal control of the meeting by the chairman
    - "Flags" for panelists to use to request the floor
    - Controlled interventions with the use of microphones for panelists
    - If desired, taping of the proceedings could be arranged

- Several presentations would be given on the opening day:
    - Statement of the objectives of the Special Panel
    - Final report of SS/WP4
        - Explanation of the Selection Criteria
        - Reports on each proposed system
    - Statements by each proponent

- Discussions and recommendations would be centered on identifying the system which best satisfies the Selection Criteria. The procedures shown in the Recommendation Process would be used.
    - Systems would be ranked on each Selection Criteria.
    - Inferior systems would be eliminated.
    - An overall best choice may become obvious when all systems have been ranked according to each Selection Criteria.
    - If no single winner becomes apparent, the relative importance of the Selection Criteria would be determined by the Panel.
    - If more than one choice continues to exist, the Panel would develop rationale for why each choice might be adopted by the FCC. The Panel would also list the disadvantages of each choice.
    - The goal of the meeting would be to reach consensus on an ATV system to be recommended to the Advisory Committee.

- Drafting groups would be assigned tasks as the meeting progresses. All text, including recommendations, would be approved by the full Panel.

- The meeting would not conclude until the work is complete (including the week-end if the work is not complete Friday afternoon). All text prepared during the meeting would be adopted during the meeting. No "after-the-fact" approvals would be required.

Appendix I

RECOMMENDATION PROCESS